



Mercury and Thimerosal: Questions and Answers

1. What is mercury?

Mercury is a metal, a naturally occurring chemical element found everywhere in the environment. It becomes airborne when rocks erode and soil decomposes, or when coal, oil or natural gas is burned as fuel, or mercury-containing garbage is incinerated. In the atmosphere, mercury is transported by wind either as a vapor or as particles. It can fall to the ground with rain and snow, landing on soil or bodies of water. Mercury takes three major forms: metallic, inorganic, and organic.

- Metallic mercury is a shiny, silver-white metal that is liquid at room temperature. It is the purest form of mercury in that it is not combined with other elements. Metallic mercury is the familiar liquid metal used in thermometers, dental fillings, batteries, and some electrical switches. Mercury easily evaporates into the air and the vapors can be very dangerous to breathe.
- Inorganic mercury compounds are formed when mercury combines with other elements such as chlorine, sulfur, or oxygen. Because these compounds usually take the form of white powders or crystals, they are also known as “mercury salts.” Inorganic mercury salts are used in products such as antiseptic creams and ointments. Other inorganic mercury compounds are used as antibacterials. These include thimerosal, which has been used in small amounts as a preservative in some vaccines and some prescription and over-the-counter medicines. Thimerosal contains ethylmercury, which is a form of organic mercury that biotransforms to inorganic mercury.
- Organic mercury compounds are formed when mercury combines with carbon. The most common of these compounds, methylmercury, is mainly produced by microorganisms in water and soil. Methylmercury is of particular concern because it can accumulate in certain edible freshwater and saltwater fish, especially in larger and older fish, to levels that are much greater than levels in the surrounding water.

Humans and wildlife are exposed to all three forms of mercury. Most environmental mercury consists of the metallic and inorganic forms, which are quickly released from the body once exposure has occurred. The organic form tends to accumulate in humans, usually because they have been exposed to it by eating fish that have built up high levels of this form of mercury in their muscle tissue. Because mercury is everywhere, it is not possible to prevent all exposure to it. Very high levels of mercury are toxic.

2. How are recommended limits for mercury exposure established?

Several Federal agencies, including the Agency for Toxic Substances and Disease Registries (ATSDR), the Food and Drug Administration (FDA), and the Environmental Protection Agency (EPA), have established guidelines for levels of mercury exposure that are thought to be safe. Federal safety standards for mercury are based on research that has been performed on *methylmercury*. There are more data on methylmercury than on a related form called *ethylmercury* because methylmercury is more easily bound to tissue than ethylmercury, and remains there a longer time. Methylmercury is also believed to be more toxic than ethylmercury (Magos, 2001) and is the form of mercury of greatest public health concern (Mahaffey, 1999).

Recommended limits on methylmercury exposure are not “set lines” below which there is safety and above which adverse health effects will immediately occur (Mahaffey, 1999). There is a significant safety margin incorporated into all acceptable mercury exposure limits. Such guidelines are meant to be starting points for evaluation of mercury exposure, and should not be viewed as absolute levels above which harm can be expected to occur.

3. What happens if your exposure exceeds the recommended levels?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metal vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may include irritability, shyness, tremors, changes in vision or hearing, attention, language, and memory problems.

Effects of short-term exposure to high levels of metallic mercury vapors may include lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

It is important to keep in mind that being exposed to more than the recommended mercury limits does not necessarily mean you will experience adverse health effects. There is a significant safety margin incorporated into all acceptable mercury exposure limits; they should not be viewed as absolute levels above which harm can be expected to occur.

4. Who is most vulnerable to mercury?

Unborn babies (developing fetus) are more sensitive to the effects of many chemicals, including mercury. Premature babies are also more vulnerable because they tend to be very small and their brain is not as developed as that of a full-term baby. Children may be at higher risk of mercury exposure than are adults because they eat more per pound of body weight and because they may be inherently more sensitive than adults, since their nervous systems are still developing. Thus, the Food and Drug Administration (FDA) and Environmental Protection Agency (EPA) recommend that women who are pregnant or may become pregnant, nursing mothers, and young children limit consumption of freshwater fish to one meal per week (six ounces of cooked fish per adult; two ounces of cooked fish per child).

5. How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and can pass to a nursing infant through breast milk. However, the benefits of breastfeeding may be greater than the possible adverse effects of mercury in breast milk.

If a pregnant woman ingests mercury at high levels, harmful effects that may be passed from the mother to the developing fetus include brain damage, mental retardation, lack of coordination, blindness, seizures, and an inability to speak. Children poisoned by mercury may develop nervous and digestive system problems and kidney damage.

6. What is thimerosal?

Thimerosal is a very effective preservative that has been used in some vaccines and other products since the 1930's. Thimerosal contains approximately 49% ethylmercury. There is

no evidence of harm caused by the low doses of thimerosal in vaccines, except for minor reactions like redness and swelling at the injection site. However, in July 1999 the Public Health Service (PHS) agencies, the American Academy of Pediatrics (AAP), and vaccine manufacturers agreed that thimerosal should be reduced or eliminated in vaccines as a precautionary measure. Today, all routinely recommended licensed pediatric vaccines that are currently being manufactured for the U.S. market contain no thimerosal or only trace amounts.